

Claims

1. Apparatus for loading a load carrier with packing units forming a load stack, comprising:
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handling and support means, by means of which a packing unit to be loaded is supported from below throughout the operation of loading by a feed device onto the load stack and which handling and support
10 means are designed to deposit the packing unit at any selectable spatial position on the load stack.
2. Apparatus according to claim 1, comprising a lifting device for lifting and lowering the load carrier.
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3. Apparatus according to claim 1, wherein a loading aid is provided for loading of the load carrier.
4. Apparatus according to claim 3, wherein a loading aid
20 encloses at least one, preferably three sides of the load stack.
5. Apparatus according to claim 1, comprising a load-carrier tilting device for tilting load carriers in
25 order to load laterally enclosed load carriers.
6. Apparatus according to claim 3, further comprising a wrapping device for wrapping protective means around the fully stacked load stack in order to stabilize the
30 load stack, while at the same time for removal of the loading aid either the load carrier is lifted relative to the loading aid or the loading aid (60) is lowered

relative to the load carrier.

7. Apparatus according to claim 1, wherein the handling and support means comprise a stationary loading plate and a displacement device for displacing a packing unit on the loading plate in a direction (x-direction) horizontally along the broad side of the load carrier.
8. Apparatus according to claim 7, wherein the feed device feeds the packing units in each case individually on trays provided with openings, and the handling and support means comprise means for lifting a packing unit from the tray.
9. Apparatus according to claim 8, wherein the means for lifting a packing unit from the tray comprise lifting pins for engagement through the tray openings.
10. Apparatus according to claim 9, comprising a displaceable rake for feeding a packing unit, which has been lifted by the lifting pins, onto the loading plate.
11. Apparatus according to claim 8, comprising a device for carrying away the empty trays.
12. Apparatus according to claim 7, wherein the handling and support means comprise a loading tongue for acting upon a packing unit on the loading plate and for displacing the packing unit in the direction of the loading depth of the load carrier (z-direction).

13. Apparatus according to claim 12, wherein the handling and support means further comprise a scraper, which is disposed above the loading tongue and is movable independently of the loading tongue in z-direction in order to retain the packing unit at the desired position on the load stack.
14. Apparatus according to claim 13, wherein loading tongue and scraper are designed so as to be movable simultaneously in x-direction.
15. Apparatus according to claim 1, comprising a movable scanning device for detecting the instantaneous height of the load stack.
16. Apparatus according to claim 1, comprising a load-carrier changing device for exchanging a loaded load carrier for an empty load carrier.
17. Apparatus according to claim 1, comprising a rotary apparatus for rotating fed trays through multiples of 90°.
18. Apparatus according to claim 1, comprising a tray-vibrating device for defined positioning of a packing unit on the tray.
19. Apparatus according to claim 1, comprising a packing-unit tilting device for tilting a packing unit and for depositing the tilted packing unit on the tray.
20. Apparatus according to claim 1, comprising a sorting device for sorting the packing units fed to the

loading apparatus.

21. Method of automatically loading a load carrier with packing units forming a load stack, comprising the steps:
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- logging of a pick order, which comprises a plurality of packing units,
 - 10 - determination of a three-dimensional loading configuration of the packing units in the load stack,
 - determination of a loading sequence (loading order) enabling said loading configuration, and
 - 15 - successive, automated conveying of the packing units onto the load carrier in a loading order stipulated by the determined loading sequence into the position in the load stack determined by the loading
 - 20 configuration.
22. Method according to claim 21, wherein the packing units lie on a supporting device throughout the loading operation.
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23. Method according to claim 21, wherein the packing units are fed, lying in each case individually on trays, for loading onto the load carrier.
- 30 24. Method according to claim 23, wherein the trays have openings, through which lifting pins engage in order to lift a packing unit from the tray.

25. Method according to claim 21, comprising the use of a loading aid, which encloses at least one, preferably three sides of the load stack developing on the load carrier.
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26. Method according to claim 25, comprising the simultaneous safeguarding of the load stack by protective means, preferably a film, during removal of the loading aid.
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27. Method according to claim 21, comprising the step of tilting a laterally enclosed load carrier for loading with the packing units.
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28. Method according to claim 21, comprising the step of tilting packing units prior to loading onto the load carrier.
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29. Method according to claim 21, wherein the three-dimensional loading configuration is optimized with regard to the load stability of the load stack.
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30. Method according to claim 21, wherein the three-dimensional loading configuration of the load stack is optimized with regard to the utilization of space.
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31. Method according to claim 21, wherein the three-dimensional loading configuration of the load stack is optimized with regard to the possible height of the load stack.
32. Method according to claim 21, wherein the three-dimensional loading configuration is split into

individual load planes with packing units each of as identical a height as possible.

33. Method according to claim 32, wherein the loading
5 sequence is determined in such a way that the packing
units a plane are loaded always from the back towards
the front and from left (right) to right (left).
34. Method according to claim 21, comprising the step of
10 sorting the packing units prior to loading onto the
load carrier.